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Attendance patterns and factors affecting participation in organised walks: An investigation of Natural England's *Walking for Health* programme.

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Abstract

This paper examines the Natural England database of registered walkers to identify patterns of attendance in organised walks and differences in walking behaviour based on the profile of participants in *Walking for Health* (WfH), one of the largest public health interventions for physical activity in the UK. The investigation is informed by walk-history data relating to more than 79,000 participants over a two-year period. Methods used include measures of participant adherence and CHAID analysis. The results indicate that absolute participation numbers have a strong seasonal element, with a marked decline occurring around the Christmas period. Age emerges as the most significant determinant of organised walking behaviour, with older age groups exhibiting higher intensity of participation relative to younger age groups. The research facilitates a better understanding of participation in WfH and can serve to inform future delivery and the marketing of organised walking initiatives.

Keywords: aging, CHAID, organised walks, physical activity.

Research commissioned by Natural England, the government's advisor on the natural environment, involved an analysis of attendance in *Walking for Health* (WfH), one of the largest public health interventions for physical activity in the UK. WfH consists of organised, regular, and short (i.e., typically less than one hour) free walks, led by trained volunteers, that are delivered regionally and locally by partner organisations such as local authorities, primary care trusts, and voluntary organisations. These *walk schemes* are aimed at tackling health problems associated with lack of exercise and developing participant interaction with the local natural environment.

As part of its monitoring and evaluation process, Natural England developed a WfH database to record details of walkers and their walk attendance. The WfH database contains records from an Outdoor Health Questionnaire (OHQ) and from individual walk registers, which generate the walk histories. The OHQ records provide participant demographic and medical information as well as pre-registration levels of physical activity. Walking behaviour was examined based on the walk-history data of more than 79,000 participants over a two-year period.

The purpose of this paper to explore the patterns of engagement in organised walks and to examine walking behaviour in accordance with the profile of participants. In the next section, we examine evidence in support of the general health benefits of participation in physical activity, including walking, and consider the importance of walking as a physical activity from an English perspective. The methodology used for the investigation, including a description of the sample and the techniques for data analysis as well as the findings are then presented and discussed.

Evidence Base

A well-developed body of literature describes the benefits of undertaking physical activity on health. A recent briefing issued by the World Health Organisation (2010) cited physical inactivity as the fourth leading risk factor for global mortality, accounting for 6% of deaths globally. In the UK, nearly 17% of all-cause mortality can be attributed to physical inactivity (Lee, Watson, Mulvaney, Tsai, & Lo, 2012). About £900 billion was spent on healthcare costs for different diseases related to physical inactivity in the UK in 2006/07 (Scarborough et al., 2011). Apart from reducing the risk of premature death arising from the occurrence of non-communicable diseases (e.g., cardiovascular disease, diabetes and cancer) and their risk factors (e.g., raised blood pressure, raised blood sugar and being overweight), participation in physical activity promotes mental health, quality of life, and wellbeing (e.g. Ahn & Fedewa, 2011; Sofi et al., 2010); supports independent living in older age (e.g. Paterson & Warburton, 2010; Taylor et al., 2004); and can also mitigate health and social inequalities (e.g. Marmont, 2010; Timmons et al., 2012). Given the far reaching positive consequences associated with undertaking physical activity, Morris (1994) described it as the *best buy* in public health.

The above discussion considers the benefits of engagement with physical activity generally rather than from taking part in walking per se, either casually or as an organised activity. A study by McCurry et al. (2010) acknowledged the benefits of organised walks on persons with Alzheimer's disease, and provided evidence that both participant and caregiver factors contributed to the ability of individuals with dementia to adhere to a regular exercise routine. Similarly, adults who attended group walks in green spaces were found to have a significantly greater mental wellbeing, fewer depressive symptoms, and

less perceived stress than adults who did not participate (Marselle, Warber & Irvine, 2012). Blacklok, Rhodes, and Brown (2007) investigated the relationship between walking and health-related quality of life. Their findings emphasised the association of walking intensity and income to general health, but found little evidence leading to correlations with happiness. The issue of walking intensity was also emphasised by Lee et al. (2010) in a systematic review of evidence for the effectiveness of walking interventions on blood pressure. In this review, nine out of 27 randomised control trials found a significant beneficiary impact of walking on blood pressure. The characteristics of those nine trials, as opposed to the trials not showing an effect, were large samples (increasing confidence in the result), a longer intervention period, and a moderate or intensive form of walking. Along similar lines, Murphy, Nevill, Murtagh, and Holder (2007) performed a meta-analysis on walking intervention studies to assess the effect on cardiovascular risk factors. Their results showed that walking interventions significantly increased VO_2 max, while decreasing Body Mass Index, body fat percentage, and resting diastolic blood pressure in previously sedentary adults. These results complemented the findings of previous work by Manson, Grenland and LaCroix (2002) who found that lower risks of cardiovascular disease was observed with 45-75 minutes of walking per week. Another systematic review by Ogilvie et al. (2007) concluded that the most successful interventions in walking could increase participation among targeted participants by up to 60 minutes a week on average.

Taylor et al. (2004) determined that high participation rates can be achieved with short-term (less than one year) physical activity interventions. Evidence from long-term interventions was either absent or showed small difference between intervention and control groups. Similarly, Simonsick, Guralnik, Volpato, Balfour, and Fried (2005) found

strong evidence that even a small amount of regular walking can confer short-term protection from further mobility loss in functionally limited women. The authors suggested the need to get more women outdoors and to encourage those who walk to raise their participation. Further, King (2001) studied the Australian experience to promote moderate-intensity physical activity and found that mass media efforts focused on more moderate and convenient forms of physical activity such as walking, was effective among older age groups. The effectiveness of structural walking interventions through community-based senior organisations was confirmed by Pelssers et al. (2013). Furthermore, walking meets both the abilities and preferences of older adults (Taylor et al., 2004). For this reason, although age in general has a negative association with participation in sport and physical activity (Kokolakakis, Lera, & Panagouleas, 2012), this is not the case when considering walking.

A review of evidence drawn largely from systematic reviews and national guidance documents published by the UK's National Obesity Observatory (2010) suggested that the physical activity component of funded interventions should focus on activities that fit easily into people's everyday lives (e.g., walking, cycling dance). Walking is the most prevalent and preferred method of physical activity (Williams, Matthews, Rutt, Napolitano, & Marcus, 2008). Sport England's Active People Survey (APS), the largest ($N = 163,000$) annual survey of participation in sport and recreational physical activity by adults aged 16 and over in England, enabled the scrutiny of indicators of walking undertaken by the population at large based on the type, frequency, and intensity of participation. These indicators included: at least one continuous walk activity in four weeks lasting at least 30 minutes, at least one recreational walk in four weeks at moderate intensity lasting at least 30 minutes,

and four or more days (in four weeks) of at least 30 minutes moderate recreational walking. The first indicator was the most inclusive in considering walks of any intensity and even for non-recreational purposes such as commuting to work. According to the latest available APS data, nearly two-thirds of the adult population in England (67%) met this criterion in 2012. This statistic has remained relatively stable since the inaugural APS in 2005/06 and was as high as 71% in 2010. The restriction from *any* walking to moderate intensity recreational walks resulted in a steep drop in the adult participation rate from 67% to 19%, with the increased frequency of walking participation in the last definition bringing a further reduction to 15%. Consistent with the most inclusive indicator, the pattern of walking participation in England measured by the two moderate intensity indicators remained largely unchanged year-on-year since 2005/06. Nonetheless, the participation rates associated with walking among the adult population in England were higher than those rates associated with any specific sport, regardless of the intensity or frequency of participation. The high prevalence of low-intensity (i.e., occasional) walking, coupled with the high take up of moderate-intensity infrequent and regular walking relative to other forms of sport and physical activity, made walking an attractive target for interventions designed to promote physical activity in general as well as among specific groups.

Methods

WfH Dataset

Although there is extensive evidence on walking behaviour in England, our research is different in that it focussed on walk participation data from 79,038 participants from the WfH database. The database provided information on 1.49 million person walks (i.e., some may be associated with the same individual) during the two-year period from 30th March

2009 to 27th March 2011. Variables used to explain trends represent factors underpinning walking participation such as gender, age, pre-registration physical activity levels, and referrals by a General Practitioner. A regional element was also considered to account for systematic differences in walking participation among the English regions. Furthermore, regions were taken as a proxy for income since income was not captured by the OHQ. Poorer regions are located in the North and wealthier in the South. Given that the regional analysis may not be deemed of relevance to audiences outside the UK, the findings pertaining to regions are kept to a minimum. The dataset used was not based on a survey of the overall population but on a system of registration for the WfH programme. Hence, for practical reasons, an intention to participate in organised walks was assumed. Following this registration, for each week examined, a person was assigned the number one in the database if he/she participated in an organised walk, and zero otherwise. The profile of WfH registered walkers is presented in Figure 1.

< FIGURE 1 HERE >

The sample was predominantly female (72%) and aged 55+ years (72%). Around 7% of walkers had been referred to a WfH walk scheme by their doctor and 24% were active for at least half an hour on at least five days in the week prior to registration. The region with the most people registered on the WfH database was the South East (20%), with the London region accounting for the smallest proportion of registered walkers (5%). In addition to the data presented in Figure 1, 95% of the sample who stated their ethnicity was *white*.

Analytical Procedure

To assess trends in attendance on the WfH programme we divided the two-year period under scrutiny into 104 weeks. Two types of analyses were conducted. First, we examined WfH participant adherence using the indicators of '50% of available walking weeks' and 'half-life'. We considered registered walkers who had walked during at least 50% of the weeks available to them, which included walkers who started walking prior to 30th March 2009. Walkers who started in the last six months of the two-year period were excluded on the basis that their scores skewed the findings. They had not been registered on the WfH programme for long enough to add meaningful data to the analysis.

Half-life illustrated how long it took for an initial population of participants at a given time to drop to the 50% level of participation (i.e., starting from 100%). The findings as presented later were based on 16 four-week periods starting from week commencing (w/c) 4th January 2010 (period 1 (P1)) and ending w/c 27 March 2011 (period 16 (P16)). The data were collapsed according to these four-week periods to cover a calendar year in equal segments (P1 – P13) to allow seasonal differences to be explored. The additional three periods (P14 – P16) were included to gauge whether or not patterns emerged year on year.

The second method used to interrogate the WfH dataset was Chi-squared Automatic Interaction Detector (CHAID) analysis. CHAID is a technique aiming to detect interaction between variables by segmenting a population into distinct groups (i.e., predictors). The method ensures that the variance of the dependent variable is minimised within the groups and maximised across the groups. It is often used as an alternative to multiple regression in market segmentation and business studies (e.g., McCarty & Hastak, 2007). For our

research, CHAID examined the intensity of walking participation by those registered on the WfH database. The participants were divided into two categories of walking behaviour (i.e., the dependent variable). We considered intensive participation in the programme (more than 32 weeks out of 104), which corresponded to 25% of participants. CHAID analysis in SPSS was used to determine the most important participant profile factors (i.e., the independent variables) associated with the examined walking behaviour. The sample was segmented according to the independent variables that best predicted behaviour of the specific group under consideration. All the variables from the OHQ were included without imposing any personal bias regarding their perceived importance. The list of independent variables considered included the following participant information: sex, disability, GP referrals, age, numerous medical conditions (i.e., heart disease, high blood pressure, Chronic Obstructive Pulmonary Disease, diabetes, and asthma); ethnicity, region of residence, and physical activity levels prior to registration on the WfH database.

In CHAID analysis, after splitting the population according to the most significant variable, age, each of the resultant groups (e.g., 16-24 years, 25-34 years) was then split further according to the strongest statistical predictor in each case, continuing to the fourth level of analysis. The minimum group size is specified by the CHAID analysis. We used the default SPSS size of 200 because predictions for a smaller size are unlikely to be reliable or stable. For the purposes of CHAID, participant data were homogenised to reflect their walking behaviour over the two-year period. The participation pattern of someone who only registered at the beginning of the second year (i.e., week 53) was extended over the full 104 weeks. For example, someone joining WfH in week 53 and attending at least 17 walks until the end of week 104 was included in the 33+ week group.

To avoid bias in the results we ignored new participants joining in the second half of the second year, which reduced the sample size to 64,993.

Findings

As shown in Figure 2, the number of people on the WfH database showed a steady increase (the dashed line) during this time, while the change in the number of people walking week-on-week (the solid line) was somewhat erratic. However, a seasonality effect was observed both in terms of the decline in the number of walkers in the immediate pre-Christmas periods in 2009 and 2010 illustrated by the marked dips on the solid line, as well as with a levelling off on the dashed line since new walkers registering did not increase at the same rate as previously.

< FIGURE 2 HERE >

Over the two-year period there was a five-fold increase in registrations compared with a two-fold increase in the number of walkers between weeks 1 and 104. This example of a comparison between intention to walk (by means of registration) and actual participation was rare, indicating no proportional growth in the two indicators. Overall, a moderately strong positive relationship was found between the total number of WfH registrations and the number of walkers each week ($r = 0.61$). At a regional level, the strongest relationship between registrations and walkers was found in London ($r = 0.76$), and the weakest correlations were found in the Northern regions of England ($r \leq 0.50$). These findings suggested that the urban environment, although less effective in generating walking registrations relative to other regions, was more efficient in converting registrants into actual participation. Furthermore, correlations between registrations and walkers

appeared to be generally stronger among regions associated with higher average incomes such as London and the South East.

A quarterly analysis of the dataset provided additional detail about walking behaviour and enabled the derivation of the average number of weeks that someone on the WfH database walked from a maximum of 13 (for a single quarter). The eight quarters correspond to the two years under consideration: (i.e., 30 March-28 June 2009, 29 June-27 September 2009 and so on). This statistic ranged between 4.8 in quarter 7 and 5.6 in quarter 1, with a weighted average across all eight quarters of 5.2 weeks. Figure 3 presents descriptive statistics on the average number of weeks that participants walked per quarter broken down by key variables. The analysis indicated that men, older age groups (aged 55+ years), people referred by their doctor, and those who were more active pre-registration (i.e., on three or more days per week) exceeded the sample average of 5.2 weeks walked per quarter. The frequency of walking increased with age until the age of 74 and declined slightly thereafter. People aged 75+ years, however, walked more frequently than people aged between 16 and 64 years. Moreover, the most active people in the week prior to registration on the WfH database (i.e., active on all seven days) appeared to walk less frequently than those who were slightly less active (i.e., on 4 or 6 days).

< FIGURE 3 HERE >

Adherence

The previous analysis covered the entire 104 weeks under investigation. The registered walkers who had walked during at least half of the weeks available to them were measured regarding adherence. As shown in Figure 4, overall 13% of people who walked at least once prior to week 79 met this criterion. Men (15%) were more likely to adhere

than women (13%). People aged 55+ years were considerably more likely to walk on 50% of available weeks than those of a younger age (e.g., the 65-74 age group included 19%). Adherence to walks was higher among people who were already physically active but varied according to their region of residence. The difference in the adherence level between those referred by a doctor and non-referrals was marginal.

< FIGURE 4 HERE >

As mentioned in the methodology section, an alternative approach to adherence considers walking behaviour over 16 four-week periods (P1 – P16) from the beginning of January 2010 until the end of March 2011. This indicator was the *half-life*, which measured the time taken for half of the walkers in a given four-week period to disengage with the WfH programme. In Figure 5, P1 represents the first four weeks in January 2010, while P13 the last four weeks of the year, which incorporated the Christmas period. The first row of Figure 5 corresponds to the people that actually participated during P1. Those people are indexed at 100. The fluctuation of this index score shows the pattern of engagement of the P1 participants in P2-P16. For example, the P2 index score in the first row was 78, implying that 78% of the original walkers in P1 were still participating in P2. By the end of the year, at P13, only 43% of the original P1 participants were engaged in the programme. Similarly, the second row starting at P2 considers the walking participants in the second four-week period of the year, indexed at 100. The remaining time periods were displayed in the same way.

< FIGURE 5 HERE >

The general pattern was that participation declined by 20%-30% between the first four-week period and the subsequent period (e.g., from P1 to P2; from P2 to P3, if P2 was the first period; and so on). Regardless of the period in which participation began, the biggest drop in adherence occurred at the end of the calendar year, which coincided with the Christmas period (P13). Accordingly, the half-life occurred around this time of year, which may be attributed to competing attractions and the festive break. However, people seemed to return to pre-Christmas levels of walking in January (see P12 and P14). In addition, after a full year, participation recovered at 49-57% of the original level.

The previous discussion around trends in attendance and adherence was based on descriptive analysis of participant data. The following analyses used a recognised statistical technique, CHAID, to explore the intensity of walking behaviour among participants.

CHAID Analysis

CHAID was used to examine whether or not a person walked on more than 32 weeks (from the available 104) to elucidate the most important factors relating to walking participation at this level of intensity. Table 1 indicates that from a population of 64,993, almost 25% participate in at least 33 weeks. Age emerged as being the most important factor at this level of participation.

< TABLE 1 HERE >

Consistent with the findings reported previously, organised walking behaviour went against the general trend in other sports where participation tends to decline with age. At the examined level of intensity, the lowest proportion of walking participants was recorded in the youngest group while less than 5% of those aged 16-24 years walked at least once

per week on more than 32 weeks. Thereafter, participation increased with age and peaked amongst 65-74 year-olds (34%). A slight decline was apparent in the 75-84 years and 85+ years age groups compared to the 65-74 age group, but the level of intensive walking by 75-84 year olds was still higher than the other age categories. In comparison with the overall position, where around a quarter of people walked on at least 33 weeks, intensive walking behaviour was positively influenced by those aged 55-84 years with negative effects associated with 16-54 and 85+ year olds.

Following the age variable, the flow of significant classifications revealed by CHAID are summarised in Table 2. The second level of CHAID analysis revealed further sub-groups for each age category. Three age groups (45-54, 55-64 and 75-84 years) were divided by pre-registration levels of physical activity, two age groups (16-24 and 35-44 years) were divided by disability, and the age groups 65-74 and 25-34 years were divided by region and gender respectively. No further sub-groupings for the 85+ age group were revealed.

< TABLE 2 HERE >

Considering the 45-54, 55-64 and 75-84 age groups associated with levels of pre-registration physical activity, low indices of active days (0-2) were always associated with negative effects on walking. Individuals who were either inactive or least active prior to registration were also less likely to exhibit intensive walking behaviour. Positive effects were apparent for the more active amongst those registered (i.e., indices 4-6). However, the most frequent levels of pre-registration physical activity (i.e., on all 7 days) actually had a marginally negative influence on walking as exemplified in the 55-64 age group - see Table

3. Among the participants aged 55-64 years with low (2 days) and high (7 days) weekly pre-registration activity, there were positive associations with health-related or medical conditions (e.g., disability and high blood pressure).

< TABLE 3 HERE >

As Table 2 showed, the disability factor was most important in the age groups 16-24 and 35-44 years. In both cases, the result was counterintuitive by showing that disability was a positive factor for organised walking participation. For example, of the 9% of those aged 35-44 years who walked for 33 or more weeks, 11% reported having a disability, of whom 16% walked for at least 33 weeks. For individuals without a disability the corresponding statistic fell to 9% as shown in Table 4.

< TABLE 4 HERE >

A similar pattern was evident amongst 16-24 year-olds and the inference might be that the relatively low impact nature of walking made it attractive to people with disabilities that may be less able to pursue more intensive physical activity. Alternatively, the organised more structured nature of health walks was perhaps better tailored towards the needs of people with disabilities or those with limiting longstanding illnesses.

Conclusions

The health benefits associated with physical activities such as walking are well-documented in academic and policy-related literature. Furthermore, given its accessibility, walking is the most prevalent form of physical activity. This research took a closer look at the patterns of engagement with walking as an organised activity. It highlighted the seasonal importance of peaks and troughs in participation and also revealed differences in

the nature of walking participation according to the demographic and medical profile of participants and their predisposition to physical activity prior to registration.

The finding that women were nearly three times more likely than men to subscribe to organised walks was encouraging given the suggestion made by Simonsick et al. (2005) to encourage more women outdoors. While registration was positively correlated with attendance, it appeared that regional influences such as the local environment and income levels may contribute to the efficiency of converting registrations (i.e., intentions) into attendance (i.e., behaviour). People who walked at least once adhered to the programme on more than half the weeks available to them (fewer than one in five) and were intensive walkers taking part on 33 or more weeks (one out of four). Perhaps such apparently sporadic attendance reflects one of the attractions associated with walking, as it is relatively straightforward to return and get back into the habit after a period of absence.

Participation in WfH tended to decline in the period leading up to Christmas, which coincided with the half-life, where participants fell below half of their original numbers. Recovery occurred in January comparable to pre-Christmas levels. One option to address this seasonal influence might be to introduce family-oriented walks during the holiday season to encourage continued attendance. This idea resonates with Taylor et al.'s (2004) policy recommendation that more effective approaches for maintaining exercise participation in the long-term are necessary.

The findings also have wider application in terms of the marketing of organised walking initiatives. Marketing efforts are best directed towards specific segments who are more likely to engage with, and benefit from, organised walks. When looking at sustained participation in WfH, age emerged as the most important factor. However, contrary to the

norm, the incidence of intensive walking behaviour was higher among older age groups. These findings indicated that organised walking was more appreciated as people got older with a particular boost around retirement age. Previous research has demonstrated the effectiveness of walking interventions on this demographic (e.g. King, 2001; Pelssers et al., 2012; Taylor et al., 2004). The paradoxical finding of high levels of physical activity prior to joining WfH having a small negative effect on intensive walking behaviour might be explained by the likelihood of walking not satisfying the intensity requirements of the most active participants, who may then switch to other activities. Finally, among some of the younger age groups and people who are highly engaged in sport, a worthwhile tactic may be to target those who have a disability or medical condition.

The analysis is restricted by the design of the survey instrument, which was beyond the authors' control. Limitations include lack of questions regarding income, occupation, education, and civic involvement, which are important factors in determining sports participation (see Kokolakis et al., 2012). A survey adjustment in this direction would be beneficial to shift the focus from the existing regional segmentation to more informative factors of participation. Nonetheless, from a practical standpoint, the findings emerging from this research facilitate a better understanding of participation in the programme and should serve to inform its future delivery. They are of value to the Ramblers and Macmillan Cancer Support, who have recently inherited the running of WfH from Natural England.

References

- Ahn, S. & Fedewa, A. L. (2011). A meta-analysis of the relationship between children's physical activity and mental health. *Journal of Pediatric Psychology*, 36 (4), 385-397.
- BBC (2005). Walk your way to fitness advice. Available online at:
<http://news.bbc.co.uk/1/hi/health/4145225.stm>
- Blacklock, R., Rhodes, R., & Brown, S. (2007). Relationship between regular walking, physical activity, and health-related quality of life. *Journal of Physical Activity and Health*, 4, 138-152.
- King, A. (2001). Interventions to promote physical activity by older adults. *Journals of Gerontology*, 56A, 36-46.
- Kokolakakis, T., Lera, F. L., & Panagouleas, T. (2012). Analysis of the determinants of sports participation in Spain and England. *Applied Economics*, 44, 2785-2798.
- Lee, I., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N. & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *The Lancet Physical Activity Series Working Group; The Lancet*, 380, 219-229.
- Lee, L., Watson, M., Mulvaney, C., Tsai, C., & Lo, S. (2010). The effect of walking intervention on blood pressure control: A systematic review. *International Journal of Nursing Studies*, 47, 1545-1561.
- Marselle, M., Warber, S. & Irvine, K. (2012). Natural health service: Enhancing wellbeing with group walks in green spaces. *BMC Complementary and Alternative Medicine*, 12(suppl 1), 324.
- Manson, J., Greenland, P. & LaCroix, A. (2002). Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *The New England Journal of Medicine*, 347, 716-725.

- Marmot, M. (2010). Fair society, healthy lives: The Marmot review: Strategic review of health inequalities in England post-2010. Available online at:
<http://www.instituteofhealthequity.org/Content/FileManager/pdf/fairsocietyhealthyvives.pdf>
- McCarty, J. & Hastak, M. (2007). Segmentation approaches in data-mining: A comparison of RFM, CHAID, and logistic regression. *Journal of Business Research*, 60, 656-662.
- McCurry S. M., Pike K. C., Logsdon R. G., Vitiello M. V., Larson E. B., & Teri L. (2010). Predictors of short- and long-term adherence to a daily walking program in persons with Alzheimer's disease. *American Journal of Alzheimer's Disease & Other Dementias*, 25 (6), 505-512.
- Morris, JN. (1994). Exercise in the prevention of coronary heart disease: Today's best buy in public health. *Medicine and Science in Sports and Exercise*, 26 (7), 807-14.
- Murphy, M., Nevill, A., Murtagh, E., & Holder, R. (2007). The effect of walking on fitness, fatness and walking blood pressure: A meta-analysis of randomised, controlled trials. *Preventive Medicine*, 44, 377-385.
- National Obesity Observatory (2010). Treating adult obesity through lifestyle change interventions- a brief paper for commissioners. Available online at:
http://www.noo.org.uk/uploads/doc/vid_5189_Adult_weight_management_Final_220210.pdf
- Ogilvie, D., Foster, C., Rothnie, H., Cavill, N., Hamilton, V., Fitzsimons, C., & Mutrie, N. (2007). Interventions to promote walking: systematic review. *BMJ*, 334, 1204.
- Pelssers, J., Delecluse, C., Opdenacker, J., Kennis, E., Van Roie, E., & Boen, F. (2013). "Every step counts": Effects of a structured walking intervention in a community based senior organisation. *Journal of Aging and Physical Activity*, 21, 167-185.
- Paterson, D. H., & Warburton, D. E. (2010). Physical activity and functional limitations in older adults: A systematic review related to Canada's physical activity guidelines. *International Journal of Behavioral Nutrition and Physical Activity*, 7 (38), 1-22

- Scarborough, P., Bhatnagar, P., Wickramasinghe, K. K., Allender, S., Foster, C., & Rayner, M. (2011). The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: An update to 2006-2007 NHS costs. *Journal of Public Health*, 33 (4), 527-535.
- Simonsick, E., Guralnik, J., Volpato, S., Balfour, J., & Fried, L. (2005). Just get out the door! Importance of walking outside the home for maintaining mobility: Findings from the Women's Health and Aging Study. *Journal of the American Geriatrics Society*, 53, 198-203.
- Sofi, F., Valecchi, D., Bacci, D., Abbate, R., Gensini, G. F., Casini, A., & Macchi, C. (2010). Physical activity and risk of cognitive decline: A meta-analysis of prospective studies. *Journal of Internal Medicine*, 269 (1), 107-117.
- Taylor, A. H., Cable, N. T., Faulkner, G. F., Hillsdon, M., Narici, M., & Van Der Bij, A. K. (2004). Physical activity and older adults: a review of health benefits and the effectiveness of interventions. *Journal of Sports Sciences*, 22 (8), 703-725
- Timmons, B. W., LeBlanc, A. G., Carson, V., Gorber, S. C., Dilman, C., Janssen, I., et al. (2012). Systematic review of physical activity and health in early years (aged 0-4 years). *Applied Physiology Nutrition and Metabolism*, 37 (4), 773-92.
- Williams, D. M., Matthews, C. E., Rutt, C., Napolitano, M. A., & Marcus, B. H. (2008). Interventions to increase walking behavior. *Medicine and Science in Sports and Exercise*, 40 (7 Suppl), S567-73.
- World Health Organisation (2010). Global recommendations on physical activity for health. Available online at: http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf?ua=1

Table 1

CHAID Level 1 analysis showing participation in more than 32 weeks by age group

	Population per category	Participation rate (33+ weeks)	Effect	Standard deviation	F statistic following the 'node'
All	64,993	24.8%		0.432	508.1 (age)
Age 16-24	2,013	4.7%	Negative	0.211	18.3 (disability)
Age 25-34	3,938	5.9%	Negative	0.236	36.3 (gender)
Age 35-44	4,800	9.4%	Negative	0.292	28.4 (disability)
Age 45-54	10,001	15.5%	Negative	0.363	34.1 (pre-reg activity)
Age 55-64	19,658	28.8%	Positive	0.453	47.6 (pre-reg activity)
Age 65-74	18,909	34.0%	Positive	0.474	64.8 (region)
Age 75-84	5,170	30.3%	Positive	0.459	15.6 (pre-reg activity)
Age 85+	504	22.4%	Negative	0.417	n/a

Table 2

CHAID: Significant levels of analysis

Level 1	Level 2	Level 3	Level 4
Age 16-24	Disability	Gender	
Age 25-34	Gender	Disability, Pre-reg activity	Region
Age 35-44	Disability	Region, Pre-reg activity	Region
Age 45-54	Pre-reg activity	Region	Heart disease, Blood pressure
Age 55-64	Pre-reg activity	Region	Disability, Blood pressure, Asthma, Ethnicity, GP referred
Age 65-74	Region	Pre-reg activity	Gender, Blood pressure, Asthma,
Age 75-84	Pre-reg activity	GP referred, Gender, Heart disease	n/a
Age 85+	n/a	n/a	n/a

Table 3

CHAID analysis of walking on 33+ weeks by 55-64 year olds

Level 2	Population	Participation rate	Factor	Level 3	Level 4 positive factors
All age 55-64 F=47.6	n=19,658 std dev=0.45	28.8%			
Pre-reg active days/week: 2 or 7	n=5,436 std dev=0.44	26.9%	Negative	Region F=13.12	Disability High Blood Pressure
Pre-reg active days / week: 4-6	n=4,582 std dev=0.47	32.6%	Positive	Region F=28.06	Asthma White British
Pre-reg active days per week: 3	n=3,683 std dev=0.46	30.2%	Positive	Region F=22.16	High Blood Pressure No Disability
Pre-reg active days per week: 1	n=2,186 std dev=0.43	23.9%	Negative	Region F=24.63	No GP referred
Pre-reg active days per week: 0	n=2,085 std dev=0.40	20.1%	Negative	Region	n/a

Table 4

CHAID analysis of walking 33+ weeks by 35-44 year olds

Level 2	Population	Participation rate	Factor	Level 3 positive factors	Level 4 positive factors
All age 35-44 F=28.4	n=4,800 std dev=0.29	9.4%			
Disability	n=552 std dev=0.36	15.6%	Positive	Some regions F=13.87	n/a
No disability	n=4,248 std dev=0.28	8.6%	Negative	Pre-reg activity level: 6 F=23.28	Region

Figure 1

Sample demographics

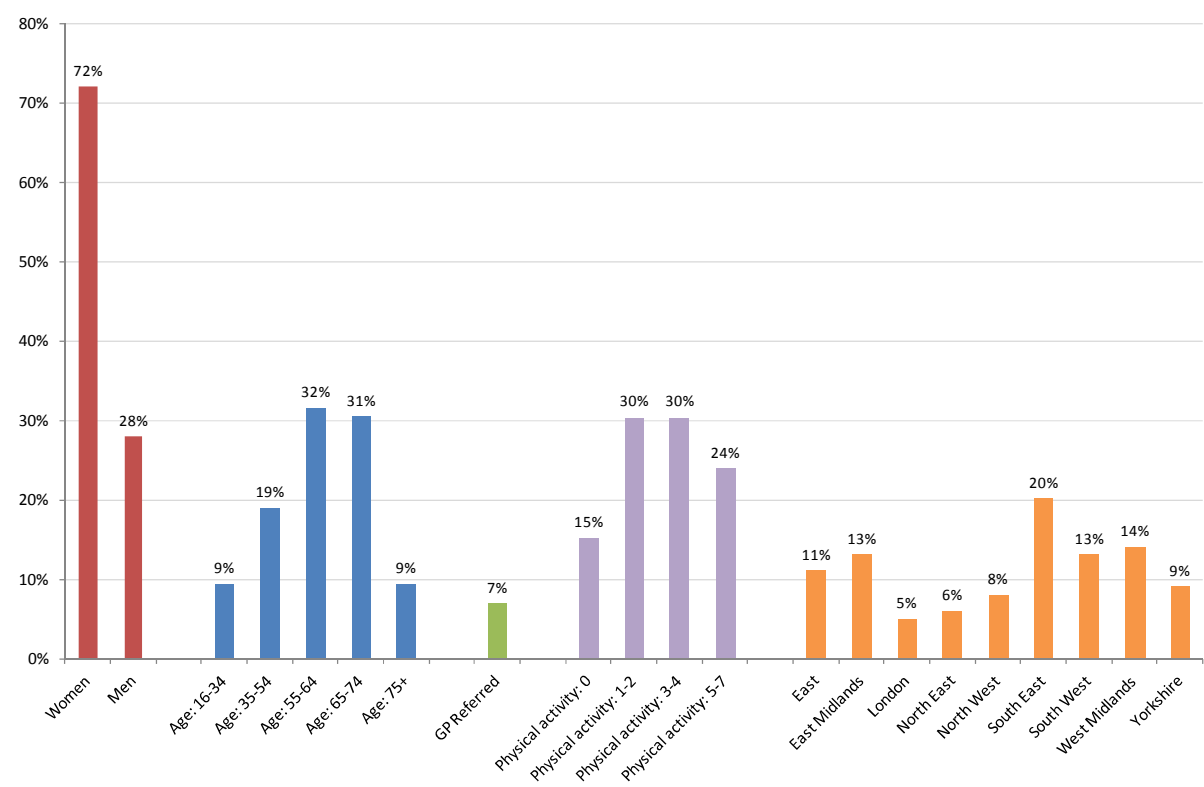


Figure 2

Walk history - registrations vs. walkers

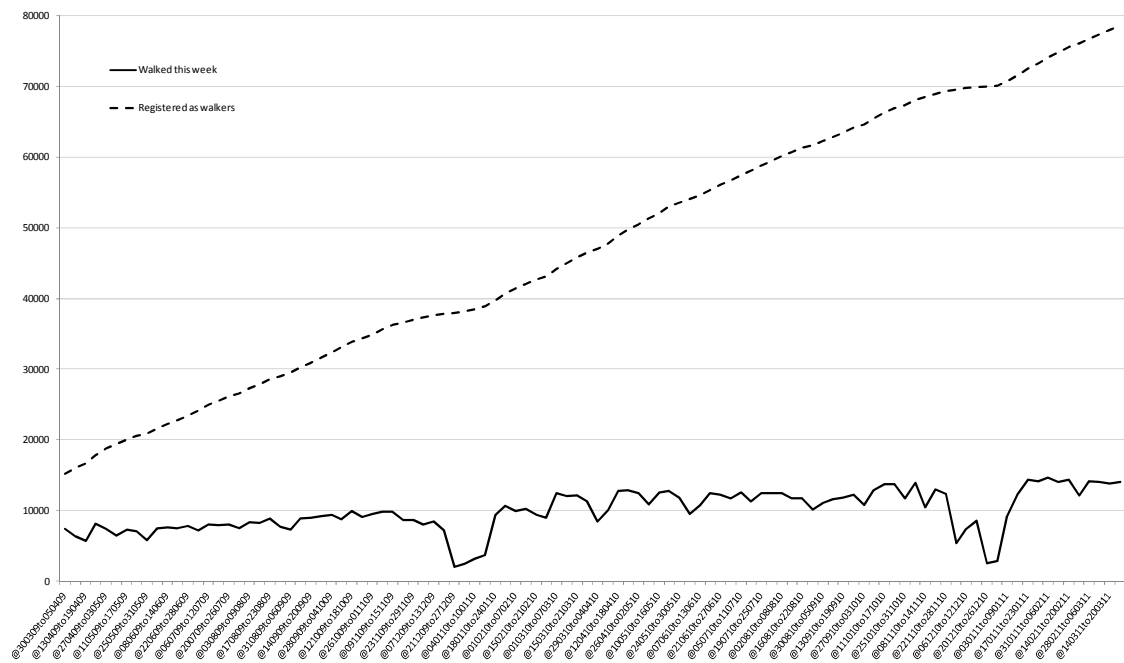


Figure 3

Average weeks walked per quarter

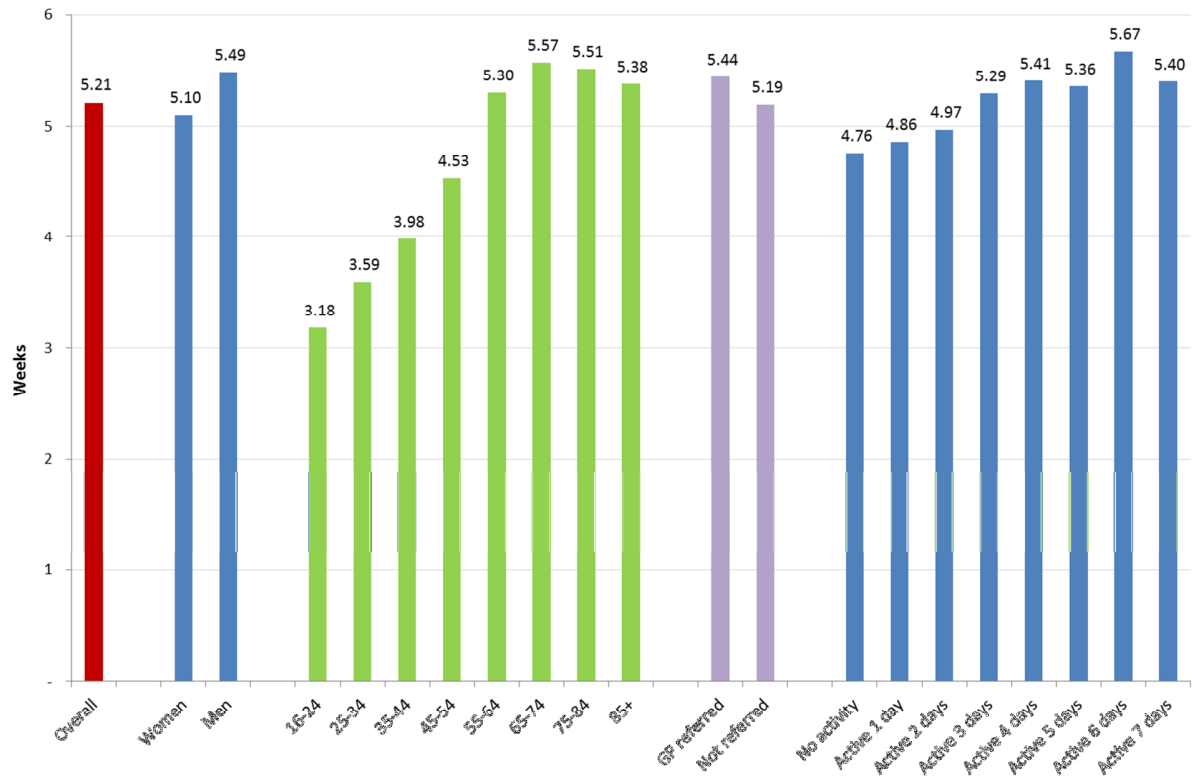


Figure 4

Percentage of registrants who walked on 50%+ of the available weeks

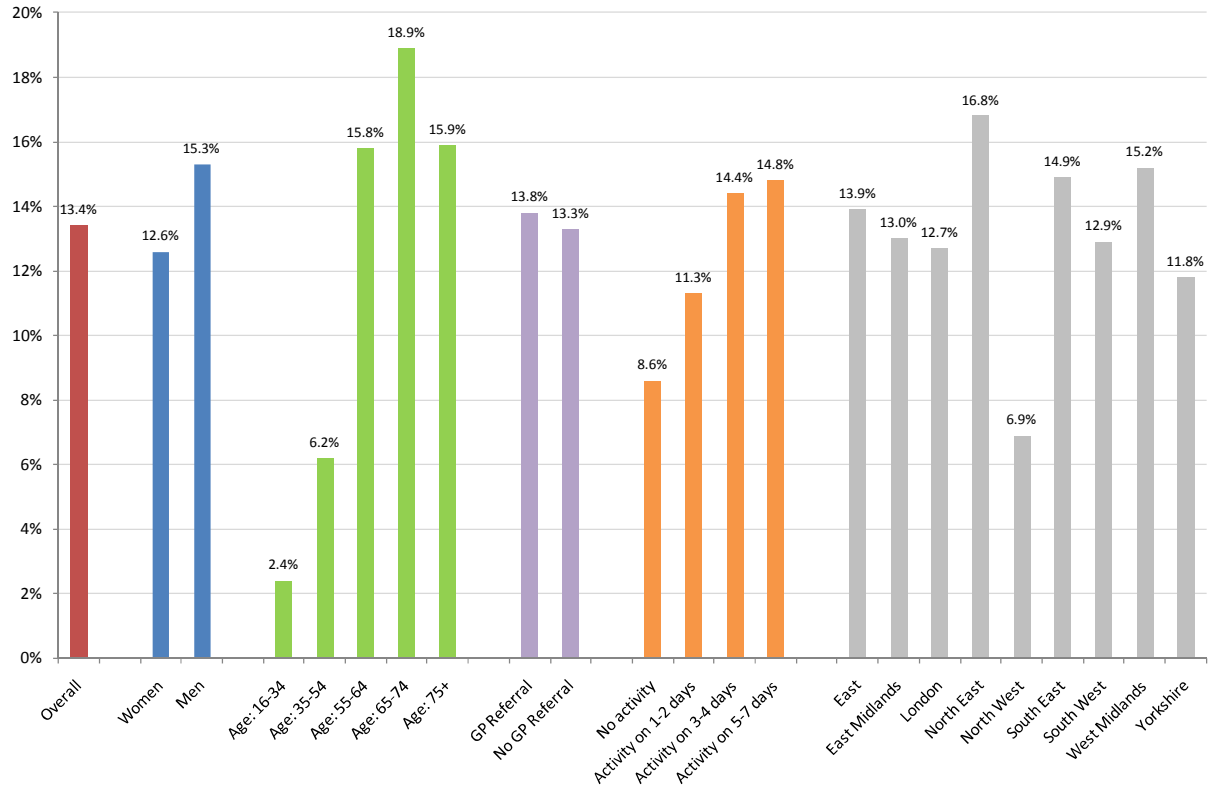


Figure 5

Drop off in walkers across16 four-week periods

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
1	100	78	78	72	71	67	66	64	60	61	62	56	41	57	57	55
2		100	80	71	70	65	65	62	59	59	60	53	38	54	55	52
3			100	71	69	63	63	60	56	56	57	50	36	51	51	49
4				100	76	69	67	64	60	60	60	53	38	53	53	51
5					100	72	69	65	60	60	60	52	37	52	53	51
6						100	76	70	65	64	64	56	39	55	56	54
7							100	74	66	65	65	57	39	56	56	54
8								100	73	68	68	59	41	58	58	56
9									100	74	72	62	43	61	61	59
10										100	76	65	44	62	62	60
11											100	70	45	65	65	62
12												100	53	73	72	69